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Mycological Notes.—IV

By Byron D. Halsted

Mould of the Paeonia.—During the last week of May a most remarkable development of *Botrytis vulgaris* Fr. was met with upon garden paeonias. At that time the plants were in an apparently vigorous condition ; they were pushing their flower stalks and the buds beginning to show pink color. While the outer leaves of the clumps were in a healthy condition all the inner ones hung brown and lifeless upon the stems and were overrun with a surprising growth of *Botrytis*.

This fungus is not uncommon upon the old leaves late in the season and the flowers may show it occasionally ; in fact no. 2459 of Ellis and Everhart's N. A. Fungi is this species collected upon paeonia petals by Dr. Kellerman.

In the present instance the fungus was playing no saprophytic rôle, but flourished as a parasite upon the rank spring herbage of the host and, at the time examined, was spreading upon the outermost leaves of the clusters. It seems to be a clear case of an unusual outbreak of a comparatively harmless paeonia fungus destroying all the foliage that was not directly in sight.

The conditions favoring this are the many rainy days that preceded the time of the inspection, there having been eighteen out of the twenty-eight upon which showers had fallen, and the excessive cloudy weather—the month up to that time having a record of twenty dark days.

The writer has had no better illustration of the influence of rainfall and consequent absence of sunshine upon fungous growth, for in this case only the outermost leaves exposed to the sun and air were healthful, while all within the umbrella-like cover that these made were dead or dying and literally covered with a dense growth of conidiophores and the multitudes of spores. The young foliage that otherwise might have been normal was destroyed by the *Botrytis* that had been highly favored by continued moisture, lack of sunshine and the confinement of the spore-laden air in the interior of the clumps.

Rust of Phlox subulata.—*Phlox subulata* L. grows quite abundantly upon the red shale cliffs in the vicinity of New Brunswick. As its name suggests it is a prostrate plant sending up short flower stalks in very early spring. By the first of June it is like a mat of moss upon the exposed places where it grows.

Attention was attracted to this plant upon a recent botanical excursion by the more upright habit of some of the specimens. A closer examination revealed the fact that they were attacked by a rust. In passing it may be stated that low creeping plants are quite apt to have the stems more upright when infested by a rust.

The rust in question is quite different microscopically from *Puccinia plumbaria* Pk., that is found upon *Phlox divaricata* L., *P. longifolia* Nutt. and *P. Douglasii* Hook., but agrees closely with *Puccinia Gileae* Ell. & Hark., as found upon *Gilia divaricata* Torr., *G. squarrosa* H. & A. and *G. intertexta* Steud.

Dr. Kelsey has distributed it upon *Phlox Richardsonii* Hook. from Helena, Montana, and is given upon *P. caespitosa* Nutt. var. *condensata* Gr. in Farlow's Host Index.

So far as is learned from the locality of the hosts and the specimens of the species in the herbarium, namely: From California, collected by Dr. Harkness, the author of the species, upon *Gilia divaricata* Torr., two specimens from Moses Craig, Corvallis, Oregon, one upon *Gilia squarrosa* H. & A., and the other upon *G. intertexta* Stend., and the specimens from Dr. Kelsey, collected at Helena, Montana, upon *Phlox Richardsonii* Hook., it would seem that the species of rust is particularly a far western one, and the present find extends its range to the Atlantic coast.

The so-to-speak eastern rust of the *Phlox*, *Puccinia plumbaria* described by Peck in volume six of the Botanical Gazette and mentioned for Illinois by Dr. Burrell, also reaches across the continent, for Dr. Harkness collected it in California upon *Phlox Douglasii* Hark. Thus the two species are widespread in the United States and probably not as yet found elsewhere.

Sun-exposed Leaves and Blight.—That the leaf blight (*Cylindrosporium padi* Karst.), is often more abundant upon one half of the cherry leaf than the other, has been a matter of observation for years and the cause of the peculiarity was not determined in the writer's case at least, until recently, when after an inspection of fifty trees the fact of the relation of sun exposure to the development of the blight became known.

The first theory employed was the position of the leaf upon the twig, but there were so many exceptions to the rule that the latter was not established. The cherry leaf has a way of bending the two halves of the blade upward so that the underside of the leaf is the only one in sight and may be unequally exposed accordingly. Such leaves upon any tree hang in all possible positions in relation to the sun, but taking a tree as a whole, there is a shady and a sunny side. In like manner there are some of the leaves so posed that one of the upturned halves is southward. When such leaves are situated upon the south side of the tree the conditions are fulfilled for the production of an instance when the fungus of the leaf is largely confined to the sunny half.

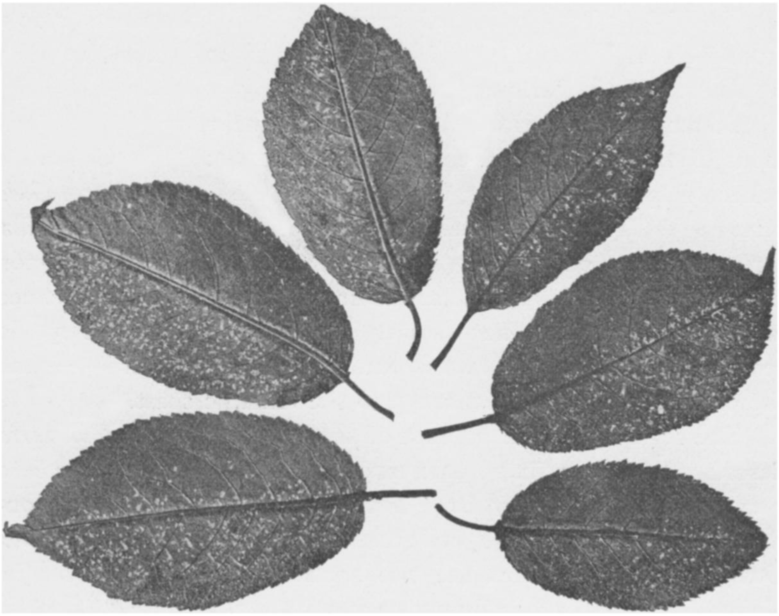

FIG. 1.

The observations were made in part upon small trees and the observer's eye could take the position of sun, that is, the rays of sunlight at mid-day were parallel to the line of vision when the person was so placed as to see the greatest abundance of the fungus upon the leaf in question or in fact upon the whole tree.

How the excess of blight is brought about by this exposure is not demonstrated for it may be that the position, unnatural in part at least, brings about a scalding or burning of the tissue of the underside of the leaf, which is reasonably assumed to be less hardy than that of the upper side; and this in turn, might prepare the way for the better entrance of the germs or their more vigorous growth after once within the leaf, already partially devitalized. It is possible also that the sunny side may furnish the more favorable conditions of warmth, etc., for the development of the blight. Fig. 1 shows some instances of cherry leaves that have a large majority of the spore spots of the blight fungus upon one-half of their underside. The three upon the right hand were from the southwest side of the tree and the other three from the southeast side.

Influence of Fungi upon Fruitfulness of Host.—While inspecting the asparagus fields in New Jersey for the prevalence of the rust, one fact came out that is seemingly contrary to a general law of vegetable physiology, namely, the influence the rust seems to have upon fruitfulness. In the years before the rust made its appearance the autumn "brush" of the pistillate plants were heavily loaded with berries, and late in the season the ripened fruit gave a bright red coloration to the field. During the present season the berries are very few indeed, and nearly all the plants appear as if they were staminate.

It is safe to assume that the rust since its first appearance in 1896 has weakened the plants, making the crop of spring smaller than usual and materially reducing the size of the autumn growth.

In other words the plant's life was in jeopardy and as a consequence an increased tendency would be expected toward fruitfulness. When the life of an individual is in danger there is an attempt, as a rule, to reproduce by seed.

This exception to the general rule does not seem to arise from the rust actually blighting the flowers, but upon the other hand, the blossoms did not form and the great majority of the plants showed no signs of reproduction.

The Trenton Goldbach poison Case.—On Saturday, October

13th, Herman Gebhardt, a workman in Trenton, N. J., went nutting to Crosswick Creek near Bordentown, and while there gathered some fine specimens of a toadstool. When near his home he went into a butcher shop kept by Harry Goldbach to have his walnuts weighed. He exhibited his mushrooms, as he thought them to be, and Goldbach was attracted by them and bought a quantity. Gebhardt took the remaining ones to his boarding place and asked his landlady to have them prepared for his supper, but his wish was not granted, it being late and inconvenient, and he carried them to Walters' saloon near by and were placed behind the bar until morning where Mrs. Walters seeing them, removed the lot of six or seven toadstools and burned them. From a conversation with Mrs. Walters and her description of the size and color of stipe, cap, gills, etc., it was quite clear that the species was *Amanita phalloides* (L.). This view was confirmed by Mr. V. K. Chestnut of the U. S. Department of Agriculture, who with Gebhardt visited the place where the toadstools were gathered and saw other specimens, which Gebhardt pronounced to be of the same kind that he had sold.

The specimens obtained by Goldbach were cooked upon Sunday morning and eaten by the whole family of nine except Max Goldbach. In a talk with the County Physician Rogers and the other physicians in charge of the cases it was learned that the first symptoms of poisoning were observed on Sunday evening when violent vomiting set in with all the eight who partook of the toadstools, and it was very prolonged. On Monday night all became worse the leading characteristic being as stated great weakness. Early upon Tuesday morning Mrs. Goldbach and her eight-year-old son died at nearly the same time, and at four o'clock in the afternoon the father died after great agony.

At the time of my visit four other victims were prostrated and in a very weak condition, while a two-year-old child had entirely recovered. Later advices indicate that all except the three previously mentioned will recover.

Fungus prolongs the apparent Vitality of Host.—During the autumn months a smut (*Ustilago Rabenhorstiana* Kuehn) is common upon the crab grass (*Panicum sanguinale* L.) and doubtless has a material effect in reducing the amount of seed produced by the weed. There is a very striking difference between the normal and the infested plants that renders it an easy matter to distinguish them. The smutted specimens, invariably the whole plant, are much more leafy and the inflorescence rarely comes to view, but remains as a plump mass of black spores inclosed by the uppermost leaves.

One of the points of interest connected with the smutted *Panicum* is the fact that it remains green long after the healthy plants have turned brown or lost their leaves. In going over a field covered with the crab grass in late October the smutted plants are quickly detected by the profusion of leaves of a deep green color. Such plants often send out new roots at the joints, as if making a desperate attempt at fruitfulness in spite of the smut that changes each flower cluster into dusty spores as soon as it is formed.

From the nature of the smuts generally and the observed facts in this case, it is probable that the infection takes place while the plants are quite young and the fungus afterwards infests all portions.

Early in the life of the plant the habit of growth is changed, and the fungus reaches the full fruitful condition before it is visible. It is only in the advanced stage of the disease that the mass of spores comes to view by the separation of the leaf bases that previously hid it from sight. In the normal plant the stem elongates and carried up the forked inflorescence, but here the stem remains short with its tip inclosed within enlarged leaves that are of darker green than the healthy plants. This same dark green is characteristic of the turnip plant that is having its roots destroyed by the club-root fungus—a very conspicuous shade of green to those who recognize it.

One Fungus develops in the Host Immunity from another.—In a recent collecting tour it developed by inspection that the rust *Puccinia mamillata* Schrt., while common upon the ordinary plants of the climbing smart weed (*Polygonum dumetorum* L.) it was nearly absent from all those infested with *Ustilago anomala* J. Kunge. It would seem that the smut had taken possession of the plant and the latter did not longer furnish the proper feeding ground for the rust. The same thing was found true in case of the smutted specimens of *Panicum sanguinale* L., the leaves of which are rarely affected with *Piricularia grisea* (Cke.), while the normal plants have the foliage quite generally spotted with it.

In a bed of fruiting radishes the writer had also noticed that certain plants will have the inflorescence malformed by the *Peronospora parasitica* (Pers.), while others close at hand were victims of the *Cystopus candidus* (Pers.); but it is rare that a flower or seed vessel bears both of these common fungi. To a limited extent it would seem that the radish infested with the white mould is immune from the mildew, which is generally considered as its general associate and because of the supposition that it feeds upon the *Cystopus* it has received *parasitica* as the specific portion of its name.

If the observations were extensive enough the statement possibly might be made that a wheat, rye or out plant afflicted as it is, if at all, with smut from a seedling on, would be at least partially immune from the rust. The smut gains entrance to the seedling and possibly renders the host unsuited to the entertainment of other fungous guests.

Effect of leaf Fungi upon autumn Coloration of Foliage.—Very striking illustration of the effect of leaf fungi upon the autumnal coloring of foliage was met with this year in the case of a tree of the hard or sugar maple (*Acer saccharum* Marsh). The leaves were mottled green and pale lemon yellow, particularly those upon the lower and inner branches, while the upper foliage of the tree and that exposed more fully to the sun was nearly uniformly yellow. It would seem from an inspection of the tree that the mottling was associated with shade and perhaps the coolness and longer periods of moisture that attend the protection of the foliage from the direct sunshine.

The spots upon the otherwise yellow leaves were of all sizes but averaged a half inch or so in diameter and were of a green color, irregular in outline and disposed without order, some leaves having but one green blotch while others had nearly the whole area occupied by them. Fig. 2 shows a leaf with the blotches. The color values of green and yellow are so nearly the same as to make it difficult to get a sharp photograph of the spots.

A microscopic examination of the under surface of the mottled leaves showed clearly that a fungus was invariably associated with the blotches, it being the common maple mildew (*Uncinula circi-*

nata C. & P.). It was interesting to note that, in the present stage of the fungus, a few mature perithecia were to be found at or near the geographical center of the blotch, usually along side of a vein and the hyphae extended radially to the margin.

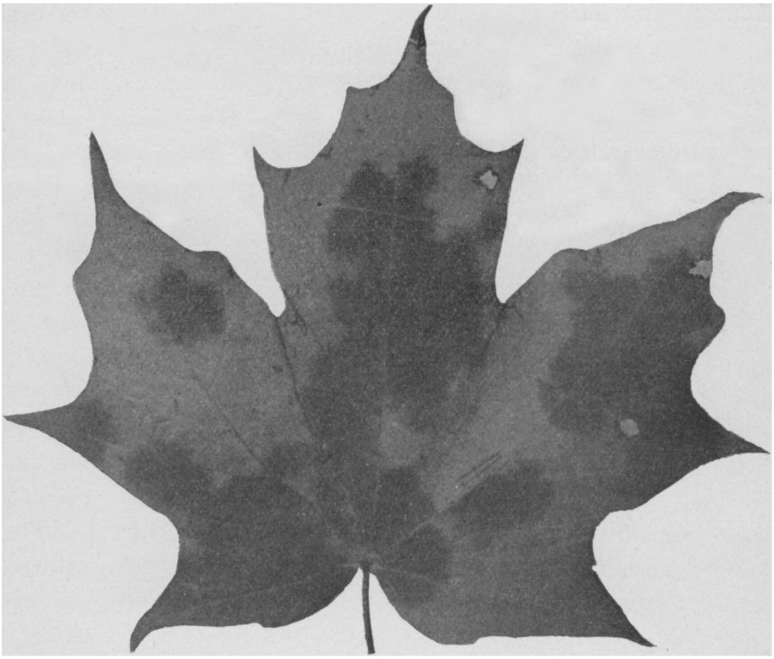

FIG. 2.

The fungus, judging from the size of the perithecia, must needs have been upon the leaf long before any discoloration began to take place and probably had spread to the full extent of the blotch before its presence could have been detected by the autumn discoloration.

Much of interest centers in the action of the fungus upon the portion of the host that is under its immediate influence. Whether it renders the affected protoplasm sluggish so that the chlorophyl is not withdrawn, or the cells more active by supplying them with the proper nourishment and the work of synthesis goes on as usual, are conjectures simply and no explanation of the peculiar phenomenon in question. To look at the leaves it would seem to be a case of symbiosis of the mutualistic sort.

Late Growth of Bean Mildew.— *Phytophthora phaseoli* Thax., upon the Lima bean is remarkable in that it thrives upon the pods after the plants are killed by the frost. Upon October 24th, the writer could have picked from one large field bushels of pods in all stages of growth that were badly infested with the mildew and in a very flourishing condition. It is true, however, that while the foliage of the beans was destroyed by the frosts the pods remained apparently untouched, and therefore the tissue upon which the fungus grows is uninjured. The facts remain, nevertheless, that this *Phytophthora* grows luxuriantly in the cool weather of late autumn.